RICE RESEARCH

SOUTHERN UTILIZATION RESEARCH
and
DEVELOPMENT DIVISION

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

SUBJECT INDEX

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AGRICULTURAL RESEARCH SERVICE
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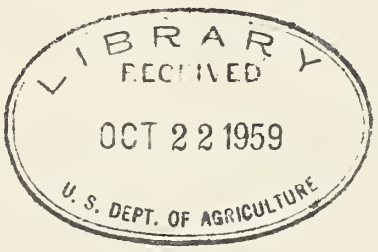

A Listing, With Abstracts, of Publications Reporting Research on the Processing and Utilization of Southern-Grown Rice

Compiled and Edited
by
MARIE A. JONES
February, 1959

Acknowledgment is made of the assistance of Dr. Ralph W. Planck in assembling the list of publications, and that of Miss Leah Katz in preparing the cover design.

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Single copies of available reprints may be obtained without cost from: Southern Utilization Research and Development Division, P. O. Box 7307, New Orleans 19, La.

Purchase copies of patents from: U. S. Patent Office, Washington, D. C. (25 cents per copy).

SOUTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

For purposes of research by the U. S. Department of Agriculture on utilization of agricultural crops, the country has been divided into four regions. Each region is served by a Utilization Research and Development Division of the Agricultural Research Service. The southern area includes Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, and Texas. Headquarters for the Division are located at:

Southern Regional Research Laboratory
1100 Robert E. Lee Boulevard
New Orleans, Louisiana

This laboratory conducts research on utilization of cotton, cottonseed, rice, tung, peanuts, and other oilseeds, sugarcane and sugarcane products, and sweetpotatoes, and on fundamental chemistry and process engineering and development applicable to utilization of these crops. Five field stations in the Division are located near sources of supply of the raw materials being studied. These field stations are:

U. S. Sugarcane Products Laboratory, Houma, Louisiana

Naval Stores Station, Olustee, Florida

U. S. Fruit and Vegetable Products Laboratory, Winter Haven, Florida

U. S. Food Fermentation Laboratory, Raleigh, North Carolina

U. S. Fruit and Vegetable Products Laboratory, Weslaco, Texas

For information on any of the lines of research being conducted in the Southern Utilization Research and Development Division, you are invited to write or visit the Southern Regional Research Laboratory, or the field station immediately concerned with the product in which you are interested.

More Knowledge of Rice Utilization Sought

Interest in utilization research on rice has been stimulated greatly during the past two decades. Rice studies at the Southern Regional Research Laboratory have been adapted to the needs of the industry, which have changed greatly in response to changing economic and technological conditions.

The first research projects on rice at the Southern Laboratory were aimed at finding new uses for byproducts, such as rice bran, to bring more returns from the crop. The shift to mechanical harvesting, now generally practiced on rice farms in the United States, brought with it a number of problems connected with artificial drying.. Research projects were initiated to learn more about the effects of drying, and to gain information to improve drying and milling processes.

Today, consumer demand for convenience foods, and keen competition in the food industry, have shown the need for new products from rice, and for improved quality and uniformity of the products already being marketed. More knowledge of the chemistry and processing characteristics of rice is necessary to achieve these goals, and much of the rice research at the Southern Laboratory is focused on these objectives, although other phases of handling and utilization are not being neglected.

Some of the earliest rice work here applied to the production and properties of oil from rice bran. It was found that an odorless, tasteless oil of high quality, suitable for use as a cooking oil, could be produced. The filtration-extraction process developed at the Southern Laboratory proved applicable to the extraction of rice bran oil. Further investigations showed that by an additional step, a hard wax, with properties similar to those of carnauba and other high grade imported vegetable waxes could be produced. Improvements in refining methods afforded a solution to one of the major problems of rice oil production, that of refining losses high in comparison with most other edible oils. A patent was recently granted on this development.

When rice bran is stored without extraction of the oil, free fatty acids are formed, causing damage to the quality of both bran and oil. Investigation of the problem revealed enzyme activity as the cause of spoilage. Although heat treatment to inactivate the enzyme will slow the deterioration process, early extraction of the oil remains the most practical solution to this problem. The growing rice oil industry, based largely on these developments, is producing rice oil annually in excess of 11 million pounds, valued at $1.5 million. The principal use of the bran itself is for feed. Bran from which the oil has been extracted often brings a premium price because it keeps better in storage.

The change to combine harvesting necessitated artificial drying of rice, and greater knowledge of the effects of heat was required. Practical rice-drying procedures had to be developed, the first of these largely as a result of experimentation in commercial plants. At the Southern Laboratory, experiments were conducted to determine the effects of time and temperature of heating, and the relationship between moisture content and temperature on the viability of rough rice, as well as the effect of prolonged storage on the viability of heat-treated rice. Investigations of the hygroscopic equilibria of rough rice at elevated temperatures have also provided data of value to rice millers and handlers.

"Souring" of rough rice in storage inspired investigation of this problem, and led to the discovery that proper aeration prevented this kind of spoilage. Research on the effects of milling conditions on the quality of rice, conducted at the University of Arkansas under contract with the U. S. Department of Agriculture, developed information on processing conditions and humidity control which, if generally adopted in rice mills should greatly increase the amount of head, or whole grain, rice produced.

Currently, improved drying methods developed by the Western Utilization Research and Development Division for California short-grain rice are being investigated for adaptability to processing of the medium- and long-grain rices grown in this area. The tests are a cooperative project carried out by the Western and Southern Divisions with industry cooperation. The Agricultural Marketing Service, the Rice Pasture Experiment Station of the Texas Agricultural Experiment Station, and the Louisiana Seed Testing Laboratory are also cooperating in the trials. Experiments carried out with medium-grain rice during the 1958 season showed good results. Because of unfavorable weather conditions, the tests on long-grain rice were inconclusive, however, and further experiments are being considered.

Recent and current rice research at the Southern Laboratory has been aimed at ascertaining chemical and physical factors which determine quality in rice and its processed products, and at developing information which may serve as a basis for new products and expanded markets.

In some areas, the United States and Australia, for example, people like dry, fluffy rice, while in others, such as Cuba and Japan, people prefer the sticky kind. In any case, the housewife wants to be sure that when she cooks rice it will turn out the same every time. Different varieties vary widely in the rate at which they absorb water and give up solids into the cooking water. Studies have been conducted on these properties as well as the cooking qualities of different varieties.

Freezing has some pronounced effects on the properties of starch, and because starch constitutes a major portion of the rice grain, freeze-processing has been adapted to the study of differences in properties between certain long-, medium-, and short-grain rices. Work on the fundamental aspects of these studies is now in progress.

Results of research on rice at the Southern Utilization Research and Development Division are reported in nearly 60 technical papers, most of which describe important advances in rice technology.

Knowledge of the chemistry and technology of rice has lagged behind that of most other important cereal crops. The reason for this, perhaps, is that rice is so good in itself it is usually cooked and eaten with very little special preparation. Although much remains to be done, a great deal has been accomplished already, and these accomplishments offer great encouragement for a continuing program which may be reasonably expected to bring important advances to the rice industry, and new and better products to the consumer.

58. HYDRATION CHARACTERISTICS OF RICE AS INFLUENCED BY VARIETY AND DRYING METHOD

Hogan, Joseph T.; and Planck, Ralph W.

Cereal Chem. 35: 469-82. 1958

Milled rice samples of ten different varieties, three processed rices, and Century Patna variety dried at different temperatures were treated with water for 10-40 minutes at 70°—98° C. Determinations were made of the water absorption of the treated grains, of contents of undissolved solids, and of dissolved materials taken into the treating water. High values in each of these properties were obtained with varieties which were cooked to a sticky condition and are generally considered undesirable. Low values were obtained with the long-grain varieties preferred for cooking and kernel cohesiveness. These varieties have high amylose contents and a tendency to yield a firm, dry, and nonsticky cooked product. The differences in water absorption and in dissolved and undissolved separated solids are directly related to the kernel cohesiveness and other cooking characteristics and are readily determined by the methods outlined.

57. THE EFFECT OF FREEZING ON THE HYDRATION CHARACTERISTICS OF RICE

Roseman, Arnold S.

Food Technol. 12: 464-68. 1958

Rices cooked or heat-treated in water or steam to contain various percentages of water were slowly frozen and then dried. Marked differences were observed in the appearance, structure, and rate of water absorption of the products. Long-grain varieties, containing at least 60% water before freezing and processed according to the conditions described, were chalky in appearance, considerably enlarged and, when immersed, absorbed water readily, even at 25° C. Short-grain varieties did not respond as well to the freezing treatment and a sample of glutinous rice showed no measurable change. Freezing followed by slow thawing, and relatively low drying temperature were required for the alteration.

56. COOKING QUALITY OF WHITE RICE MILLED FROM ROUGH RICE DRIED AT DIFFERENT TEMPERATURES

***Batcher, Olive M.; *Little, Ruby R.; *Dawson, Elsie H.; and Hogan, Joseph T.**

Cereal Chem. 35: 428-34. 1958

Quality evaluations were made on samples of Century Patna and Rexoro varieties of rice which had been air-dried at room temperature or forced-air dried at 120° F. (49° C.), 140° F. (60° C.), or 160° F. (71° C.). A panel evaluated color, cohesiveness, and absence or presence of off-flavor of the cooked rice by ranking and scoring techniques. Measurements were made of volume, water absorption, starch, and total solids after treatment with water at 99° C., and also of the reaction of the rice to treatment with dilute alkali. Variations in some of the quality characteristics by panel evaluations, and by treatment with water at 99° C. or with dilute alkali were observed for some of the milled samples of rough rice dried at different temperatures. However, the variations were not linearly related to successive increases in temperatures, nor were they similar for the two varieties. Forced-air drying of rough rice at elevated temperatures did not cause marked improvement or deterioration in the cooking quality of milled rice.

55. ALKALI REFINING RICE OIL IN THE PRESENCE OF A OH GROUP-CONTAINING ADDITIVE

U. S. Patent No. 2,844,613, July 22, 1958

Cousins, Edwin R.; **Bhodhiprasart, Sakuntala; and *Prachankadee, Rabieb

A method is described for materially reducing the refining loss of "hard to refine" vegetable

* Human Nutrition Research Division, U. S. Department of Agriculture, Washington, D. C.

** Department of Science, Ministry of Industry, Bangkok, Thailand.

oils, including some types of rice, cottonseed, peanut and soybean oils. The vegetable oil is alkali refined in the presence of 0.5 to 5% (of the weight of crude oil) of at least one OH group-containing compounds selected from the group consisting of sugars and 2- and 5-carbon atom polyhydric aliphatic alcohols. Among the additives used were blackstrap molasses, sucrose, ethylene glycol, and glycerol.

54. SOUTHERN LABORATORY CONTINUES RESEARCH AND DEVELOPMENT

Deobald, H. J.

Rice J. (Ann. Issue) 61(8): 36, 39. 1958

Work at the Southern Utilization Research and Development Division on rice for the year 1957-58 is reviewed. Freeze treatment as a tool for studying rice quality and as a guide to possible new product development; the use of water absorption, the degree of fragmentation of rice during cooking and the amount of rice solids dissolved in the cooking water; and a cooperative project of Agricultural Research Service, Human Nutrition, and Agricultural Marketing Service with Foreign Agricultural Service to compare rices in foreign commerce with the domestic varieties are the principal projects discussed. The projected rice research program of SURDD, investigation of the nature of the constituents of rice which determine cooking and processing characteristics, is outlined.

53. PROCESS OF RECOVERING RICE BRAN WAX

U. S. Patent No. 2,802,844, August 13, 1957

Feuge, Reuben O.; and Cousins, Edwin R.

A commercially feasible process for producing, from the tank settlings of crude rice bran oil, a hard wax that approaches carnauba wax in physical properties.

52. MICROFLORA OF MILLED RICE

***Kurata, Hiroshi; **Ogasawara, Kazuo; and Frampton, Vernon L.**

Cereal Chem. 34: 47-55. 1957

Milled rice used in this study was representative of the 1954 crop in the Southern rice-producing area of the United States. The samples were taken from commercial channels by the Grain Division, Agricultural Marketing Service, USDA, using techniques normally employed for collecting samples for grading and inspection. The rice was found to be free from internal infection by bacteria, yeasts, and actinomycetes, and virtually free from internal infection by fungi.

51. BETTER RICE PRODUCTS A GOAL—SOUTHERN REGIONAL RESEARCH LABORATORY CITES SOME AIMS

Planck, R. W.

Rice J. (Ann. Issue) 60(7): 67-68. 1957

Rice research carried on at the Southern Regional Research Laboratory during 1956 is reviewed briefly, with reference to the lines of investigation pursued and application of the work. Technical papers reporting on these research projects are listed.

50. MEETING THE CHALLENGE OF THE FUTURE

Altschul, A. M.

Rice J. 59(8): 15-21, 45. 1956

Needs for research to improve the quality of rice and rice products, and to increase their use, are outlined. In the interest of increased utilization, technological needs of the rice industry are put into four categories: better quality for present use; new uses for the major product; major product at lower cost; and new uses for byproducts. Research already done, or now

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** Food Sanitation Section, Hokkaido Institute of Public Health, Hokkaido, Japan.

in progess, by USDA on rice utilization is briefly discussed, and some information on rice consumption cited.

49. RICE WAX EXTRACTION

U. S. Patent No. 2,759,956, August 21, 1956
Pominski, Joseph; Vix, Henry L. E.; and Eaves, Paul H.

A process for solvent-extracting rice bran to obtain a wax which is hard, free of rice oil, and comparable to carnauba wax in many of its properties.

48. SOUTHERN REGIONAL RESEARCH LAB AIMS AT IMPROVING UTILIZATION OF RICE

Planck, R. W.
Rice J. (Ann. Issue) 59(7): 54-57. 1956

This is a review of rice research at the Southern Utilization Research and Development Division, aimed toward the development of basic information that will contribute toward the processing of rice into edible products of the highest quality. Topics discussed include: physical and chemical changes associated with rice cooking; souring of freshly-harvested rice; microbiological examination of milled rice; composition and density of rice oil solutions, and activities of the rice industry reaserch committee. A bibliography of papers on rice published by the Division during 1955, and in press or preparation for 1956, is appended.

47. RICE QUALITY AND RICE OIL RESEARCH AT THE SOUTHERN REGIONAL RESEARCH LABORATORY

Planck, R. W.
Rice J. (Ann. Issue) 58(7): 40-41, 98. 1955

Major accomplishments in rice research at the Southern Utilization Research and Development Division during the past year are reviewed. It was found that the variety of rice and the drying methods affect rates and extent of absorption of water. Aeration with normal air is a practical method to prevent souring of undried rice, and new observations indicate that the real cause of souring is the anaerobic respiration of the seeds. Equilibrium moisture relationships of rough rice at elevated temperatures were evaluated. A cost study on the filtration-extraction process for simultaneous recovery of rice oil and wax was carried out. It was discovered that refining losses of rice oil can be reduced 32-55% by adding certain organic compounds to the oil before the regular refining procedure; blackstrap molasses is the cheapest of the effective materials tried.

46. RICE BRAN OIL EXTRACTION PROCESS

U. S. Patent No. 2,727,914, December 20, 1955
Gastrock, Edward A.; Vix, Henry L. E.; D'Aquin, Esler L.; Graci, Angelo V., Jr.; and Spadaro, James J.

A process of extracting oil from rice bran which comprises: mildly cooking the bran while controlling moisture so that in the early stages of cooking the bran particles contain 14 to 26% moisture and in the final stages they contain 6 to 18%, using an overall time of 15 to 70 minutes and increasing the temperature from an initial 170-210° F. to a final temperature of nearly 235° F.; crisping the cooked particles by reducing temperature below 130° F. and moisture content by 2 to 4%; and mixing the prepared rice bran particles with a solvent for rice bran oil, subjecting the resultant slurry to filtration, repeating the mixing with solvent and the filtering a plurality of times.

45. PRELIMINARY COST STUDY OF RICE WAX FILTRATION-EXTRACTION

Pominski, J.; Decossas, K. M.; Eaves, P. H.; Vix, H. L. E.; and Pollard,
Ind. Eng. Chem. 47: 2109-11. 1955

Rice bran is a potential domestic source of hard vegetable wax. A new filtration-extraction process for producing rice wax while simultaneously recovering oil has been developed on a bench scale. This paper gives estimated additional equipment and operating costs and returns for producing this wax in a commercial filtration-extraction plant that would process 100 tons of rice bran per day for the oil. A break-even chart shows an an approximate net profit of $22,000 for 250-day plant operation. The additional investment and operating costs needed to produce rice wax are reasonable and its production should considerably increase the income of the rice oil producer.

44. EFFECTS OF HEAT TREATMENT ON THE VIABILITY OF RICE. A REPORT OF RESEARCH AND A LITERATURE SURVEY

McFarlane, V. H.; Hogan, J. T.; and McLemore, T. A.
U. S. Dept. Agr. Tech. Bull. No. 1129. 51 pp., Illus. December 1955

Effects of temperature, time of heating, and moisture content variables on the ability of heat-treated rice to germinate were evaluated in terms of the germination test. When temperature was the major variable, injury to the viability of rice of a given moisture content was greater the higher the temperature. The critical temperature range was in the neighborhood of 8° to 12° C. The extent of this critical range or "zone of heat damage" was about the same for rice of each moisture content but its position on the temperature scale was higher the lower the moisture content of the rice. When moisture content was the major variable, injury to viability was less as the moisture content decreased. When time of heating was the major variable, injury to the viability was observed to be greater the longer the period of heating, only when temperature of treatment exceeded the lower limiting temperature of the critical range for rice of the moisture content involved. The literature describing effects of different kinds of heat-treatments on the viability of rice is reviewed. Germination test data for rice, and seed heat-treatment methods and their applications are discussed.

43. ETHANOLAMINES AND OTHER AMINO- AND HYDROXYL-CONTAINING COMPOUNDS IN THE REFINING OF RICE OIL

Cousins, E. R.; *Prachankadee, R.; and *Bhodhiprasart,
S. J. Am. Oil Chemists' Soc. 32: 561-64. 1955

In alkali refining of rice oil by the procedure usually employed for cottonseed and similar oils excessive losses occur. Losses in refining a rice oil containing about 5% free fatty acids may amount to more than 40% by the cup method. These studies indicate that refining losses may be greatly reduced by adding certain organic compounds containing NH^2 and OH groups to the crude oil just before carrying out the regular refining procedure. The technique was effective in both batch and continuous processes. Sucrose or blackstrap molasses appear to be the most practical materials to use; however, ethanolamines and various glycols and alcohols may also be employed. The method was also applied to cottonseed oil with some success.

42. BENCH-SCALE METHOD FOR EVALUATING THE PROCESSING CHARACTERISTICS OF OILSEEDS FOR FILTRATION-EXTRACTION

Graci, A. V., Jr.: Spadaro, J. J.; **Paredes, M. L.; D'Aquin, E. L.; Vix, H. L. E.
J. Am. Oil Chemists' Soc. 32: 129-31. 1955

A simple laboratory testing apparatus and its use are described. With relatively few pounds of material it is possible to evaluate many preparation and filtration variables and

* Department of Science, Ministry of Industry, Bangkok, Thailand.

** Barrio Buenos Aires, Tegucigalpa, D. C., Honduras, Central America.

to predict with a fair degree of accuracy the behavior of a continuous horizontal vacuum filter. It is felt that such a unit will be invaluable for use in commercial plants, especially during the start-up operations of a new plant. The bench-scale unit should also find application in connection with other processes employing the unit operations of extraction and filtration.

41. HYGROSCOPIC EQUILIBRIA OF ROUGH RICE AT ELEVATED TEMPERATURES

Hogan, J. T.; and Karon, M. L.
J. Agr. Food Chem. 3: 855-60. 1955

The hygroscopic equilibria of rough rice have been determined at 80° to 111° F. for moisture contents of 11 to 22% dry basis. The data have been correlated by an Othmer plot in which temperature, moisture content and vapor pressure data are presented graphically. The plot permitted calculation of the relative isosteric heat of adsorption of water by rough rice of varying moisture content. The Harkins-Jura equation indicated that adsorption of water occurs as a condensed film over 14 to 20% moisture content. Application of the Brunauer-Emmett-Teller equation to available data on rough rice indicated that adsorption of moisture as a unilayer occurs over a range from dryness to approximately 7% moisture content. The amount of water, which constitutes a unilayer of adsorbed water on rough rice, is approximately 7 grams per 100 grams of rice.

40. COMPREHENSIVE SPECIFIC GRAVITY TABLES FOR MIXTURES OF GLYCERIDIC OILS WITH COMMERCIAL HEXANE

Skau, E. L.; Magne, F. C.; and Mod, R. R.
U. S. Dept. Agr. ARS-72-2, 8 pp., 9 tables. Processed. August 1955

Comprehensive composition-temperature-specific gravity data for binary mixtures of glyceridic oil with commercial hexane have been calculated and tabulated. From the tables it is possible to determine the specific gravities of any oil of vegetable, animal, or marine origin with commercial hexane at any temperature from 40° to 110° F.; to determine the composition of any such mixture, that is, the percentages of oil and solvent, from its specific gravity, or to determine the rate of change in specific gravity with change in temperature of any such mixture of known composition. It is necessary to know only the specific gravities of the oil and the hexane in question. Derivation of the equation by which the data are calculated is given, together with instructions to enable the user to prepare similar tables for any other solvents.

39. GENERAL DENSITY EQUATION FOR GLYCERIDIC OIL-SOLVENT MIXTURES. CALCULATION OF DENSITY-COMPOSITION-TEMPERATURE DATA FROM OIL AND SOLVENT DENSITIES

Skau, E. L.; Magne, F. C.; Mod, R. R.; and Durr, R. L.
Ind. Eng. Chem. 47: 1043-49. 1955

A simple quadratic equation has been derived which permits direct calculation of the density or the composition of any oil-solvent mixture, the temperature being known, from the densities of the oil and the solvent. The validity and general applicability of this equation have been established on the basis of extensive experimental data on 41 oil-solvent systems. The equation makes data for known and unknown systems readily available in any desired density or temperature units, eliminates graphical interpolations, and is applicable to all crude or refined animal, vegetable, and marine oils.

38. EFFECT OF MILLING CONDITIONS ON BREAKAGE OF RICE GRAINS

Autrey, H. S.; Grigorieff, W. W.; Contractor: University of Arkansas Institute of Science and Technology, Stuttgart and Fayetteville, Arkansas; Altschul, A. M.; and Hogan, J. T.

J. Agr. Food Chem. 3: 593-99. 1955

Reprinted in World Rice 2(11): 4-5, 10-11, 14-15, 19. 1955

Effects of milling conditions on the yield of whole grain rice were studied, both in a pilot mill and in commercial rice mills. Relative humidity appears to be a major factor influencing breakage of rice grains; for optimum yields the mill room atmosphere should be maintained at 70 to 80% relative humidity. Equally good results can be obtained by controlling the humidity of the atmosphere in the elevators, aspirator, brush and trumble. Relationship of the yield of head rice to the percentage of bran removed indicates that four-fifths of the breakage occurs during removal of the final 25% of the bran. Use of steam and abrasives increases yields for rice on which the bran is held tightly to the kernel and increases huller capacity as much as 40%. Careful attention to these details may reduce breakage losses by several million dollars per year.

37. FOOD PROCESSING RESEARCH ON SOUTHERN FARM CROPS

Fisher, C. H. and Persell, R. M.

South. Food Processor. 15(5-A): 32-36. 1954

Progress is being made in solving some important processing problems of the South through research on citrus fruits; cucumbers, sweetpotatoes, beets, tomatoes, blackeyed peas; rice, cottonseed, peanuts, and sugarcane.

36. OILSEED RESEARCH AT SRRL: A PROGRESS REPORT

Kime, J. A.

Oil Mill Gazetteer 59(2): 34-37. 1954

The major emphasis in oilseed research is on cottonseed, but research is underway also on peanuts, tung, and minor oil-bearing substances such as sesame and rice bran.

35. RICE RESEARCH AT THE SOUTHERN REGIONAL RESEARCH LABORATORY

Planck, R. W.

Rice Annual 1954: 14-16, 18.

Subjects of recent publications on rice, reviewed in this article, include: Microorganisms associated with storage of freshly harvested rice; effect of heat on the viability of rice; drying of rough rice; moisture equilibria between rice and air; effect of changes in atmospheric humidity and temperature during milling of rice; studies of rice oil and wax; influence of variety and environment on chemical composition; studies of x-ray photography of kernels to identify the stage of processing in which damage occurs to kernels.

34. YEASTS FROM FRESHLY COMBINED ROUGH RICE STORED IN A SEALED BIN

Teunisson, Dorothea

Applied Microbiol. 2: 215-20. 1954

The greatest changes in microbial populations in two lots of freshly combined rough rice stored in a sealed bin were an inhibition of mold growth and a marked proliferation of yeasts. The types of yeasts isolated from the rice stored 7 months were **Endomycopsis chodati** (Nechitch) Wickerham and Burton, **Hansenula anomala (Hansen)** Sydow, and **Pichia farinosa** (Lindner) **Hansen.** Those found in the rice stored 34 days were **E. chodati, Candida krusei** (Cast.) Berkhout, **Oospora lactis** (Fres.) Sacc., **Candida tropicalis** (Cast.), and **Hansenula anomala.** The results obtained suggest that the yeasts are potential spoilage agents of stored rough rice and that they could produce off-flavors and odors in stored rice. The souring of rice in the sealed bin for the periods used is apparently similar to the fermentation of silage.

33. SIMULTANEOUS RECOVERY OF WAX AND OIL FROM RICE BRAN BY FILTRATION EXTRACTION

Pominski, J.; Eaves, P. H.; Vix, H. L. E., and Gastrock, E. A.
J. Am. Oil Chemists' Soc. 31: 451-55. 1955

Hard rice waxes of high melting points have been obtained from rice bran, simultaneously with the production of oil, by these two methods: (1) Selective cold hexane-extraction of cooked rice bran to remove the oil, hot hexane-extraction to remove the wax, chilling of the hot miscella and separation of the precipitated wax by centrifugation; (2) single hot hexane-extraction of raw or cooked rice bran, hot water-washing and chilling of the miscella, separation of the wax precipitate by settling or centrifugation, and multiple cold hexane-washings of the wax. Wax can also be processed from rice oil settlings by the latter method after a miscella has been prepared. The cold extraction-hot extraction method should be preferable as a process when conducted on a single continous filtration-extraction unit without reslurrying. Indications are that oil refining losses may be decreased by this method. Yields of rice wax varied from 0.22 to 0.31% of the original rice bran, or 1.29 to 1.82% of the extracted oil.

32. FILTRATION-EXTRACTION: A NEW COMMERCIAL CONTINUOUS SOLVENT EXTRACTION PROCESS FOR EXTRACTION OF OLEAGINOUS MATERIALS

***Kulkarni, B. S.; Graci, A. V., Jr.; and Vix, H. L. E.**
Oils and Oilseeds J. 7(3): 5-11. 1954

Briefly described is the case-history of a novel solvent extraction process from its conception of its operation on a commercial scale. Main advantages of the new process over the conventional processes are summarized. Typical plant data have been included to confirm successful operation, and some of the novel design features of the process are illustrated.

31. FILTRAXIONE-ESTRAXIONE: UN NUOVO PROCESSO DI ESTRAXIONE DIRETTA CON SOLVENTI DEI MATERIALI OLEOSI (FILTRATION-EXTRACTION: A NEW DIRECT SOLVENT-EXTRACTION PROCESS FOR OLEAGINOUS MATERIALS)

Spadaro, J. J.; and Graci, A .V., Jr.
Olii Minerali, Grassi, Colori e Vernici 31:-103-107. 1954

This is an illustrated article giving details of procedures, equipment, results, and advantages, with filtration-extraction of cottonseed, rice bran, and soybeans.

30. CURRENT STATUS OF THE FILTRATION-EXTRACTION PROCESS FOR COTTONSEED AND OTHER OLEAGINOUS MATERIALS

Gastrock, E. A.; Spadaro, J. J.; Gardner, H. K.; Knoepfler, N. B.; and Molaison, L. J.
Oil Mill Gaz. 59(2): 40-41. 1954

Early claims for this solvent process have been equalled or bettered by commercial operations at the Greenwood, Mississippi plant, processing soybeans and cottonseed. Further bench-scale work is being conducted on application of the process to rice bran, soybeans, cottonseed, flaxseed, peanuts, and some has been done on milo germ and sesame; pilot-plant work is underway on rice bran, soybeans, cottonseed, flaxseed and milo germ. A summary is given of the various processing operations in the filtration-extraction process and some general conclusions regarding the variables encountered and steps to be taken for controlling them.

29. INFLUENCE OF STORAGE WITHOUT AERATION ON THE MICROBIAL POPULATIONS OF ROUGH RICE

Teunisson, Dorothea J.
Cereal Chem. 31: 462-74. 1954

Combine-harvested rice, air-dried to 14.3% moisture or less, contained moderate to large numbers of molds, aerobic bacteria, and anaerobic organisms; low to moderate numbers of

* Department of Chemical Technology, Osmania University, Hyderbad, India.

actinomycetes; and relatively few yeasts. Rice with 18 to 20% moisture, sealed in a glass-lined bin for 7 months in one trial and 34 days in another, became sour. Some molds survived but did not increase; aerobic bacteria survived or decreased in numbers; the facultative anaerobic organisms markedly increased; and the yeasts increased tremendously in most of the layers of the piles of rice. There was a loss in seed viability. Critical heating of the rice did not occur. Other lots with 21.5 to 32.4% moisture, stored in sealed containers in the laboratory, showed the same general changes except that the aerobic organisms often increased.

28. CEREAL QUALITY MEASUREMENT-X-RAY AND PHOTOMICROGRAPHIC EXAMINATION OF RICE

Hogan, J. T.; *Larkin, R. A.; and *MacMasters, M. M.

J. Agr. Food Chem. 2: 1235-39. 1954

X-ray techniques have been used successfully for the rapid examination of rough (unhulled) rice for cracks, checks, insect damage, and immature seed. Radiographic evidence of cracks (or checks) in grains of rough rice was confirmed by photomicrographs of halves of the same kernels. Improved techniques were used in the preparation of thin sections of rice kernels for study of the detail of the inner structure of the kernels. Quality factors, such as yield of head rice, color, stability to oxidation, and nutritive value, are related to the structural elements of the rice kernel that remain in the milled rice.

27. RECENT RESEARCH ON DRYING AND STORAGE OF ROUGH RICE

Sorenson, J. W.; Hogan, J. T., and others.

Texas Agricultural Experiment Station; Arkansas Agricultural Experiment Station; Louisiana Agricultural Experiment Station, in cooperation with the U. S. Department of Agriculture (Bureau of Entomology and Plant Quarantine, Bureau of Plant Industry, Soils, and Agricultural Engineering, and Southern Regional Research Laboratory)

Southern Cooperative Series Bull. 29, 29 pp. January 1953

Research on the drying and storage of rough rice is reported. The effects of harvesting practices, methods and extent of drying, different methods of artificial drying, final moisture content, and the relation of these factors to milling quality and germination, are among the topics discussed in the section on drying. Reports from the three states involved are included. The section on storage includes discussions of the various types of materials and structures used for storage; moisture content, temperatures, length of storage, aeration, insect control measures, and other conditions affecting the keeping quality of the grain.

26. PILOT-PLANT APPLICATION OF FILTRATION-EXTRACTION TO RICE BRAN

Graci, A. V., Jr.; Reuther, C. G., Jr.; Eaves, P. H.; Molaison, L. J.; and Spadaro, J. J.

J. Am. Oil Chemists' Soc. 30: 139-43. 1953

The pilot-plant application to rice bran of filtration-extraction is described. The process consists of mildly cooking the rice bran, cooling to about 130° F., slurrying the cooked bran with a miscella filtrate, filtering the slurry, and countercurrently washing the cake 3 times on a continuous, rotary, vacuum filter, followed by conventional recovery of oil and meal products. Cooking under the conditions described gives shorter filtration cycle time, better extractability, and virtually eliminates the fines problem. This development makes available a feasible continuous solvent-extraction process for rice bran.

25. EFFECT OF VARIABLES UPON MILLING YIELDS

Autrey, Harry S.; Contractor: University of Arkansas, Institute of Science and Technology, Stuttgart, Ark.

Rice Annual 1953: 25-26.

This is a brief, preliminary report of findings reported in detail in "Effect of Milling Conditions on Breakage of Rice Grains," by Autrey, Grigorieff, Altschul, and Hogan, J. Agr. Food

* Northern Utilization Research and Development Division, U. S. Department of Agriculture, Peoria, Illinois.

Chem., 3(7): 593-99, 1955. Relative humidity appears to be a major factor influencing breakage of rice grains.

24. RICE RESEARCH: SOUTHERN REGIONAL RESEARCH LABORATORY

Anonymous

Rice Annual 1953: 10

Information on predominant changes which take place in moist rice under different conditions of storage and on the effect of heat on properties of rough rice has been obtained. Predominant microorganisms found on rice have been identified. Experimental results indicate that higher temperatures are necessary to bring about loss of viability as the moisture content of the rice is decreased, and that high temperature is not the factor responsible for low milling yield of rice.

23. RICE BRAN OIL. VIII. TANK SETTLINGS FROM CRUDE RICE BRAN OIL AS A SOURCE OF WAX

Cousins, E. R.; Fore, S. P.; Janssen, H. J.; and Feuge, R. O.

J. Am. Oil Chemists' Soc. 30: 9-14. 1953

Reprinted in Oil and Soap (Egyptian Oil and Soap Technologists Assoc.) 4(7): 224-19. 1953

A typical sample of tank settlings from crude rice bran oil was processed to obtain a hard, nontacky wax fraction. Four procedures were investigated. One consisted of removal of the oil from the tank settlings by washing with acetone, destruction of the phosphatides through hydrolysis or saponification, and purification by fractionation from isopropanol solution. Another involved hydration of the tank settlings, followed by separation of the aqueous and oil phases, and fractionation of the oil phase from isopropanol solution. Third and fourth procedures used simple fractionation of the tank settlings with the aid of solvents. Yields of the hard wax fractions varied from 8.3 to 13.7%, based on weight of original settlings. Iodine values varied from 11.1 to 17.6, free fatty acid contents from 2.1 to 7.3%, phosphorus contents from 0.01 to 0.15%. Lowest melting point was 75.3° C. and highest 79.9. Hard wax in the liquid state was almost black and could not be bleached readily with activated clay or carbon but practically white waxes could be produced with 0.5 part of 29% hydrogen peroxide in combination with one part of chromium trioxide per one part of wax.

22. DENSITY-COMPOSITION-TEMPERATURE DATA FOR RICE BRAN OIL-COMMERCIAL HEXANE MISCELLAS

Magne, F. C.; Durr, R. L.; and Skau, E. L.

J. Am. Oil Chemists' Soc. 30: 8-9. 1953

Complete density-composition-temperature data have been obtained and tabulated for binary systems of a refined rice bran oil with a commercial hexane. Specific gravities at 5% intervals of concentration and at 10 Fahrenheit-degree intervals of temperature are given and they can readily be converted to other density units. These data can be used to determine the specific gravity, if composition and temperature are known; or, conversely, to determine composition, if specific gravity and temperature are known. The data should be useful in commercial processing and control.

21. COMPOSITION OF RICE. INFLUENCE OF VARIETY AND ENVIRONMENT ON PHYSICAL AND CHEMICAL COMPOSITION

McCall, E. R.; Jurgens, J. F.; Hoffpauir, C. L.; Pons, W. A., Jr.; Stark, S. M., Jr.; Cucullu, A. F.; Heinzelman, D. C.; Cirino, V. O.; and Murray, M. D.

J. Agr. Food Chem. 1: 988-93. 1953

The chemical composition of rough rice, milled rice, bran, polish and hulls are reviewed critically, and the results of various workers tabulated for comparison. In addition to the usual

feedstuff analyses, values are given for individual carbohydrates, vitamins, minerals, and the amino acids of rice protein. 262 references.

20. RICE RESEARCH: USDA'S SOUTHERN REGIONAL RESEARCH LABORATORY

Anonymous

Rice Annual 1952: 10-12

Growth of the rice industry from 23.6 million 100-pound bags in 1938 to 43.8 million bags in 1951. Utilization research on rice at the SRRL, beginning in 1947, is outlined. Developments in the production of rice bran oil, storage of rice and rice bran, milling studies, and investigations of the chemical and physical properties are summarized.

19. ABSTRACT BIBLIOGRAPHY OF THE CHEMISTRY, PROCESSING, AND UTILIZATION OF RICE BRAN AND OIL

Loeb, Josephine R.; and Morris, Nelle J.

U. S. Dept. Agr., Bur. Agr. Ind. Chem., AIC-328, 95 pp. Processed. 1952

About 300 abstracts are included, covering the world literature on the subject between 1876-1951. Author and subject indexes. Sources of abstracts are: **Journal of the Chemical Society** (London), 1876-1916; and **Chemical Abstracts** (American Chemical Society), 1907-1951.

18. METHOD FOR PREVENTING DETERIORATION OF SEEDS

U. S. Patent No. 2,584,972, February 12, 1952

Altschul, Aaron M.; Condon, Marjorie Z.; and Lambou, Madeline G.

Seeds, particularly cottonseed, flaxseed, sunflower seed, rice and grain sorghum, prior to storage, are sprayed with a halohydrin, such as ethylene chlorohydrin, propylene chlorohydrin, trimethylene chlorohydrin, ethylene bromohydrin, and related compounds, to inhibit heating and deterioration. The halohydrin is applied in concentration range of 0.2-1.0% on the dry-wt. basis depending on the moisture content of the seed up to 30%, preferably as the seed moves in a closed conveyor. The inhibition of the natural enzyme activity depends on the moisture content of the seed and the ratio of chemical to seed and is effective on high or low oil content or high or low carbohydrate content. Viability is not decreased. In one example brown rice, treated with 0.24% ethylene bromohydrin, did not heat, mold or develop an objectionable odor.

17. EFFECT OF MOISTURE ON THE MICROFLORA AND FORMATION OF FREE FATTY ACIDS IN RICE BRAN

Loeb, Josephine R.; and Mayne, Ruth Y.

Cereal Chem. 29: 163-75. 1952

The effect of moisture content on the growth of bacteria, filamentous yeasts, and molds in stored rice bran was compared with the effect of moisture content on the formation of free fatty acids in the oil. Microbial growth and formation of free fatty acids were affected similarly by high moisture content, both often increasing at the same time. Growth of **Aspergillus chevalieri**, one of the molds present in untreated bran, produced free fatty acids after inoculation into rice bran sterilized by autoclaving. In relatively dry, unautoclaved bran (11.5% moisture), free fatty acids were formed without a detectable increase in number of microorganisms. Fatty acids formed slowly in bran with moisture content as low as 4.5%.

16. PILOT PLANT STEAM REFINING OF HIGH FATTY ACID RICE BRAN OIL

Wellborn, W. A.; Parker, J. S.; Molaison, L. J.; and D'Aquin, E. L.

Rice J. 54(8): 6-8. 1951

High free fatty acid crude rice bran oil was steam-stripped in pilot-plant equipment under various conditions of temperature, vacuum, and quantity of blowing steam. Observations

were made on the recovery of the crude distilled acids, reduction in the overall refining loss, and the effect on the oil quality. The work indicated that bleaching, degumming, and dewaxing rice bran oil of high fatty acid content, followed by steam refining, and by alkali refining only where required, should warrant consideration as a practical method for reducing refining loss and for producing high-grade fatty acids and an improved oil.

15. LIPID CONTENT OF RICE BRAN

Jurgens, J. F.; and Hoffpauir, C. L.
J. Am. Oil Chemists' Soc. 28: 23-24. 1951

The examination of rough rice of eight varieties grown in three locations each showed variations in milling yields and lipid contents of bran and of the true pericarp and bran fraction. These differences are attributed to the influence of variety and environment on growth. The average values found on the moisture-free basis were 6.0% bran and 5.4% true pericarp and germ fraction for the rough rice and 19.5 and 21.8% lipids in the bran and in the true pericarp and germ fractions, respectively.

14. THE CHEMICAL COMPOSITION OF RICE—A LITERATURE REVIEW

McCall, E. R.; Hoffpauir, C. L.; and *Skau, D. B.
U. S. Dep. Agr., Bur. Agr. Ind. Chem., AIC-312, 44 pp.
Processed. 1951

The literature on the composition of rough, brown, and polished rice, rice bran, rice polish, and rice bran oil is summarized. Reliable information existing on the carbohydrates, nitrogeneous constituents, vitamins, enzymes, phosphorous compounds, and inorganic constituents, and on the composition and properties of rice bran oil is reviewed. The review covers 263 references.

13. RESEARCH INVESTIGATION ON RICE AT THE SOUTHERN REGIONAL RESEARCH LABORATORY

Altschul, A. M.
Rice J. 53(12): 25-29. 1950

Research at the Southern Regional Research Laboratory has included work on the problems of rice bran storage and on milling difficulties arising from the deterioration of rice in storage.

12. RICE BRAN OIL. VII. THE "FINES" FRACTION OF RICE BRAN

Morris, Nelle J.; Swift, C. E.; and Dollear, F. G.
Rice J. 53(9): 6-7, 10. 1950

Rice bran has been subjected to sieve analyses and the oil content of the various fractions as a function of particle size has been determined. The "fines" produced during pilot-plant extraction of rice bran consisted of 67.5% of material that will pass a 400-mesh sieve. Data indicated that the tendency of fines to become suspended in the miscella is dependent appreciably on the moisture content of the bran, fewer fines passing into the miscella when moistened bran of 15.6% moisture was extracted with commercial hexane. Increasing the moisture content to about 16% had no adverse effect on the yield of oil recovered by solvent extraction.

11. RICE-BRAN OIL. V. THE STABILITY AND PROCESSING CHARACTERISTICS OF SOME RICE BRAN OILS

Swift, C. E.; Fore, Sara P.; and Dollear, F. G.
J. Am. Oil Chemists' Soc. 27: 14-16. 1950

Extraction and processing characteristics and stability properties of nine batches of hexane-

* Librarian, U. S. Department of Agriculture Library, New Orleans Branch.

extracted rice bran oil were investigated. Pilot plant extractions of five batches yielded crude oils equivalent to 91% of the hexane-soluble portions of the bran. Nine crude oils whose free fatty acid content ranged from 2.0 to 6.3% were refined by the cup method, with losses ranging from 12.0 to 23.5% although the neutral oil content of six crude oils ranged from 89.9 to 92.6%. The Lovibond color of the nine refined oils ranged from 35 yellow and 4.5 red to 70 yellow and 9.5 red, and the color of the bleached oils ranged from 15 yellow and 1.5 red to 35 yellow and 3.2 red. Steam-refining in conjunction with alkali-refining proved effective as a means of reducing the losses in refining. Nine batches of refined, bleached, and deodorized oils had iodine values ranging from 101.3 to 105.7 and stabilities averaging 24 hours. Nine bleached oils hydrogenated to approximate shortening consistency had iodine values averaging approximately 66, and stabilities averaging 370 hours.

10. RICE BRAN OIL. IV. STORAGE OF THE BRAN AS IT AFFECTS HYDROLYSIS OF THE OIL

Loeb, Josephine R.; Morris, Nelle J.; and Dollear, F. G.
J. Am. Oil Chemists' Soc. 26: 738-43. 1949

An investigation of factors affecting the formation of free fatty acids in stored bran from both regular and "Converted" rice is reported. It was found that decreasing the storage temperature tends to retard the formation of these acids. The study also showed that bran from both regular and "Converted" rice can be stored for at least four months without excessive increase in the content of free fatty acids, provided the bran is dried sufficiently and is maintained at a low moisture content. A rise in the moisture content of predried bran causes a rapid increase in the free fatty acid content of the oil in the bran. Investigations of the effect of chemical inhibitors and of inert atmosphere on the rate of free fatty acid formation of regular rice bran indicated that these were ineffective in preventing deterioration.

9. THE INFLUENCE OF PROCESSING ON THE SPECTRAL PROPERTIES OF VEGETABLE OILS

O'Connor, R. T.; Field E. T.; Jefferson, M. E.; and Dollear, F. G.
J. Am. Oil Chemists' Soc. 26: 710-18. 1949

Data are presented on the results of a detailed examination of the absorption spectra from 220 mu to 720 mu of typical cottonseed, soybean, peanut, sesame, okraseed, and rice bran oils. The absorption measurements were made on both crude and processed oils at successive processing steps of refining, bleaching and deodorizing. Findings are summarized for the ultra-violet region from 220 mu, for the near ultraviolet and the blue to blue-green portions of the visible region between 320 mu and 500 mu, and for the visible portion of the spectra above 500 mu.

8. RICE BRAN OIL. VI. SOME ASPECTS OF PROCESSING AND UTILIZATION OF RICE BRAN OIL

Markley, K. S.
Rice J. 52 (10): 14, 30-25. 1949

The economic importance of rice is reviewed with emphasis upon the advantage to this country of developing new markets for all the byproducts of the rice milling industry. One of these byproducts, rice bran, is a potential source of about 50 million pounds of high quality edible oil a year, but its use for this purpose presents a number of problems not usually encountered by the oil processing industry. The Southern Laboratory's attack on these problems includes research on the extraction, composition, utilization, and stability of rice bran oil, and on the rate of deterioration of the oil in the bran after separation of the latter from the brown rice. The status of these investigations in October 1949, and some of the results obtained, are summarized.

7. RICE BRAN OIL. III. UTILIZATION AS AN EDIBLE OIL

Feuge, R. O.; and *Reddi, P. B. V.

J. Am. Oil Chemists' Soc. 26: 349-53. 1949

An odorless, tasteless, and neutral product can be obtained by conventional refining, bleaching, and deodorization of rice bran oil. The smoke, flash, and fire points are comparable to those of other high-quality edible oils; and the oil solidifies less easily than cottonseed or peanut oil and is also more resistant to oxidation. It can be winterized easily and the yield is over 90% compared to 65-75% for winterized cottonseed oil. During hydrogenation rice bran oil behaves like a typical vegetable oil. The plasticity of the hydrogenated oil is almost identical with that of cottonseed oil having a similar iodine value and the keeping quality is superior to that of cottonseed and peanut oils of similar fatty composition.

6. HYGROSCOPIC EQUILIBRIUM OF RICE AND RICE FRACTIONS

Karon, M. L.; and Adams, Mabelle E.

Cereal Chem. 26: 1-12. 1949

Reprinted in Rice J. 52(11): 6, 21-24. 1949

An investigation was made of the rate of sorption and desorption of moisture by rough rice, head rice, bran, polish, and hulls over the range 11-93% relative humidity at 25° C. The hygroscopic equilibrium of these same fractions was determined over the same relative humidity range. When the relative humidity of the atmosphere at 25° C. was raised from 10 to 90%, the moisture content of whole rice and its fractions increased as follows: rough rice from 4.4 to 17.6%, polish rice from 5.2 to 18.8%, bran from 5.0 to 18.0%, polish from 5.3 to 18.0%, and hulls from 3.7 to 15.3%.

5. RICE BRAN OIL. II. COMPOSITION OF OIL OBTAINED BY SOLVENT EXTRACTION

***Murti, K. S.; and Dollear, F. G.**

J. Am. Oil Chemists' Soc. 25: 211-13. 1948

Interest in the recovery of oil from rice bran produced by southern and southwestern mills, and the lack of data on the characteristics and composition of such oil, prompted analysis of three samples—two of crude oil and one of refined oil. These oils were obtained by solvent extraction of commercial rice brans from Texas-grown Blue Bonnet and Arkansas-grown Zenith varieties of rice from the 1946 crop. Methods used in making the analysis are outlined, and the results summarized both in tabular and discussion form. Briefly, the fatty acid composition of the samples was found to be: 0.80, 1.06 and 0.84% linolenic acid; 33.2, 30.6 and 33.1% linoleic acid; 45.0, 46.0 and 46.3% oleic acid; 17.1, 17.3 and 17.1% saturated acids; and 3.9, 5.0 and 2.7% unsaponifiable matter, respectively.

4. RICE BRAN OIL. I. OIL OBTAINED BY SOLVENT EXTRACTION

***Reddi, P. B. V.; *Murti, K. S.; and Feuge, R. O.**

J. Am. Oil Chemists' Soc. 25: 206-11. 1948

Freshly milled rice bran of good quality was extracted with commercial hexane, yielding an oil of relatively low free fatty acid content, with good color, and as stable as other crude oils of similar types. When the temperature was kept below 10° C. and the extraction discontinued at the right time, the recovered oil represented 90 to 95 percent of the total lipids in the bran. It contained very little wax—about 3 to 9 percent of the total extractable lipids—and this could be extracted easily with hot commercial hexane and other solvents. It was found that good rice bran oils behave under ordinary refining methods much like cottonseed oils of comparable free fatty acid content. Losses approximating the absolute or Wesson Loss resulted from caustic soda refining in a hydrocarbon solvent as well as from refining with sodium

* Department of Industries and Commerce, Government of Madras, India.

carbonate. When bleached in the usual way, some of the refined rice bran oils produced products acceptable for use in the edible trade. The greenish cast caused by the presence of chlorophyll was removed by bleaching with a small amount of activated clay.

3. RESEARCH ON SOUTHERN AGRICULTURAL PRODUCTS

Scott, Walter M.

Proc. Am. Railway Development Assoc. 39: 38-47. Mimeographed 1948

The increased utilization of southern farm products made possible through scientific research is discussed as a contribution to the future welfare of the South, and the Southern Regional Research Laboratory's part in this research is outlined. Efforts are directed towards modifying the qualities of cotton and cottonseed, sweetpotatoes, peanuts and rice, so as to make these leading southern commodities suitable for new or enlarged technical, scientific and industrial uses. The importance of each of these commodities to the industrial development of the South is emphasized by an analysis of its present economic position and competition from other products. Examples of research which are helping to provide enlarged markets are cited.

2. SOLVENT EXTRACTION OF COTTONSEED AND PEANUT OILS. IV. PILOT PLANT BATCH EXTRACTIONS

Pominski, Joseph; Molaison, L. J.; Crovetto, A. J.; Westbrook, R. D.; D'Aquin, E. L.; and Guilbeau, W. F.

Oil Mill Gaz. 51 (12): 33-39. 1947

A portable batch solvent-extraction plant and apparatus used at the authors' laboratory are described in detail. Some data on the use of this plant for extraction of cottonseed, okra seed, and rice bran oil are tabulated. Hexane and ether were the solvents used.

1. RICE HULLS AND RICE STRAW 1907-1944—A LIST OF REFERENCES

Ward, Kyle, Jr. (Revised and checked by J. David Reid and Dorothy Nicely. Edited by Corabel Bien.) USDA Library List No. 31. December 1946. Revised and brought up through 1955 by Nellie G. Larson, Division of Bibliography, USDA Library. July 1957

This bibliography covers the literature as reported in Chemical Abstracts, v. 1, 1907 through v. 39, 1945. The first section contains references on rice hulls; the second, on rice straw. The July 1957 edition brings the bibliography up to date through 1955, and like its predecessor is concerned with analyses of the hulls and straw, and their utilization by industry and on the farm. Information on rice bran and rice polish has been omitted.

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